

REMARKS

In view of the foregoing amendments and the following remarks, reconsideration and allowance are requested.

Status of Claims

Claims 1-5 were previously allowed. These claims are retained unamended.

Claims 6, 16-17 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. Patent No. 4,475,068 to Brailsford ("Brailsford") in view of U.S. Patent No. 5,605,614 to Bornand ("Bornand"), and in further view of U.S. Patent No. 6,094,116 to Tai et al. ("Tai").

Claims 18-19 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Brailsford in view of Borland and Tai, and in further view over U.S. Patent No. 3,900,780 to Tanikoshi ("Tanikoshi").

Claims 20-30 have been added. Claim 20 depends on the allowed Claim 1. Claims 21 and 26 are independent claims. Claims 22-25 depend directly or indirectly on Claim 21, and Claims 27-30 depend directly or indirectly on Claim 26. The subject matter in Claim 21 and Claim 26 is disclosed in the specification and does not introduce new matter.

The features of Claim 21 are supported in at least the cited portions of the specification noted below:

21. A DC motor comprising: (*figure, page, and line numbers added*)

a plurality of windings; (Fig. 7; p. 19, line 7-11)

a plurality of micromachined mechanical system (MEMS) switches (Figs. 1A, 1B, 2A, 2B; p. 3, lines 7-14) each electrically connected to one part of said windings (Fig. 7; p. 4, lines 3-5), wherein each switch is magnetically switched by a magnetic field (p. 5, lines 2-7, 13-16) without an electrical biasing

current or biasing voltage (p. 3, lines 20-22) to turn electrical power on or off in at least one of the windings; and

a rotating magnetic rotor having at least one pole to direct the magnetic field in at least one of the switches when passing by the switch (Fig. 6; p. 4, lines 5-7).

The features of Claim 26 are supported in at least the cited portions of the specification noted below:

26. A DC motor comprising: (*figure, page, and line numbers added*)

a plurality of windings; (Fig. 7; p. 19, line 7-11)

a micromachined mechanical system (MEMS) relay (Figs. 1A, 1B, 2A, 2B; p. 3, lines 7-14) electrically connected to one part of said windings (Fig. 7; p. 4, lines 3-5) for a motor phase (p. 4, lines 12-15; p.18, lines 21-24), wherein the relay is actuated in response to a magnetic field (p. 5, lines 2-7, 13-16) and operates without biasing current or biasing voltage (p. 3, lines 20-22); and

a rotating magnetic rotor having at least one pole positioned to direct the magnetic field in at least one of the relays when passing by the relay (Fig. 6; p. 4, lines 5-7).

The rejected claims, Claims 6, 16-19, and the added claims, Claims 20-30, are discussed in greater detail below.

Claim Rejections - 35 U.S.C. 103(a)

Claims 6, 16-17 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. Patent No. 4,475,068 to Brailsford ("Brailsford") in view of U.S. Patent No. 5,605,614

to Bornand ("Bornand"), and in further view of U.S. Patent No. 6,094,116 to Tai et al. ("Tai").

Claims 6, 16-17 are cancelled to obviate the rejections.

Claims 18-19 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Brailsford in view of Borland and Tai, and in further view over U.S. Patent No. 3,900,780 to Tanikoshi ("Tanikoshi").

Claims 18-19 are cancelled to obviate the rejections.

Added Claims

Claims 20-30 have been added. These claims contain subject matter that is both allowable and previously disclosed in the specification. As mentioned above, Claims 21 and 26 are independent claims.

Claim 21

Claim 21 is patentable over the prior art on record. Neither the combination of Brailsford in view of Bornand and in further view of Tai in the Office Action, nor the references individually disclose all of the elements of Claim 21 in both their **structures and operations**. Moreover, the suggested combination does not have all the **advantages** of Claim 21.

On a **structural basis**, Claim 21 has a MEMS switch that connects directly on one part of the windings and switches without a biasing current or voltage. In Brailsford, the switch has three terminals and is connected to at least a biasing source and another semiconductor device. Claim 21 states that "... each switch is magnetically switched with a magnetic field without an electrical biasing current or biasing voltage..." Hence, the switch in Claim 21 does not need electrical biasing for switching. Consequently, Claim 21 does not require the circuitry associated with the bias source in Brailsford to bias

the switch. In light of this discussion, Claim 21 is **structurally different** from Brailsford.

Claim 21 also states that "a rotating magnetic rotor having at least one pole to direct the magnetic field in at least one of the switches when passing by the switch." Tai and Bornand do not disclose MEMs switches that are positioned within a rotating magnetic field. Therefore, since at least there are distinct **structural differences** between Claim 21 and the suggested combination in the Office Action, Claim 21 is patentable.

On an **operational basis**, Claim 21 has a MEMs switch that is functionally different from the combination of the Office Action. In particular, the function of the MEMs switch is different from the Hall effect device switch of Brailsford (col. 3, lines 34-46). The switch in Claim 21 neither requires the electrical biasing current nor the voltage that is disclosed in Brailsford (col. 3, lines 34-46). It is known to one skilled in the art that a Hall effect device generates a voltage, known as a Hall voltage, when a piece of semiconductor is biased with a current and placed under a magnetic field that is orthogonal to the current flow. However, the MEMs switch simply opens and closes with a magnetic field, and no electrical component is required for switching. Therefore, Claim 21 is **operationally different** from Brailsford. Moreover, Tai and Bornand do not disclose MEMs switches operating with a rotating magnetic field. Since Claim 21 is at least **operationally different** from the suggested combination in the Office Action, then Claim 21 is allowable.

The use of the MEMs switch in the DC motor has several **advantages** over Brailsford and the combination in the office action. In space applications, for example, the use of the MEMs switch results in, "improving the reliability of components used in spaceborne systems" and "extends and improves the performance

of these systems, thus reducing associated costs" (present specification p. 2, lines 9-12). The specification also notes that "DC motors are used widely as motive devices for linear and rotary drives in spaceborne applications," and "even modest reductions in the power budget, complexity, mass, and volume of components such as these produce tremendous gains in the cost and reliability of spaceborne applications" (p. 2, lines 26-18; p.3, lines 3-5). Since Claim 21 does not require switch biasing circuitry or an additional semiconductor device, then it reduces the complexity and number of components in the DC motor. Furthermore, the **advantages** of Claim 21 are not obvious to one skilled in the art. Hence, the use of the MEMs switch in the DC motor results in improved reliability of components, extends and improves the performance of space systems, and reduces the costs and complexity of space systems.

Since at least Claim 21 has **structural and operational differences** from the references and the combination suggested in the Office Action, as well as several distinct **advantages**, it is patentable under both 35 U.S.C. 102 and 103.

Claim 26.

Claim 26 is patentable over the prior art on record. As described in the remarks concerning Claim 21 above, neither the combination of Brailsford in view of Bornand and in further view of Tai in the Office Action, nor the references individually suggest all of the elements of Claim 26 on a structural or operational basis. Moreover, the suggested combination does not have all of the advantages of Claim 26, and those advantages are not obvious to one skilled in the art. Thus, Claim 26 should be placed in condition for allowance.

Added Dependent Claims - Claims 20, 22-25, and 27-30

The added dependent claims, Claims 20, 22-25, and 27-30, each depend directly or indirectly from an independent claim discussed above. Accordingly, these dependent claims are allowable for the reasons that their respective independent claim is allowable and for reciting allowable subject matter in their own right. Independent consideration and allowance of the dependent claims are respectfully requested.

Claim 20

Claim 20 is a claim that is dependent on the allowed Claim 1. In addition to being allowable based on an allowed independent claim, Claim 20 is further allowable for citing the feature that the "relay is magnetically switched between the first and the second switching states without an electrical biasing current or voltage." The cited feature in Claim 20, disclosed on page 3, lines 20-22 of the specification, is neither obvious to one skilled in the art, nor disclosed in Brailsford. As discussed above, this feature also results in a DC motor with less complexity, lower cost and improved reliability for spaceborne applications. Hence, Claim 20 should be placed in condition for allowance.

CONCLUSION

In view of the amendments and remarks, Applicant believes that all added claims, Claims 20-30, are in condition for allowance and asks that an official notice of allowance be issued.

The foregoing comments made with respect to the positions taken by the Examiner are not to be construed as acquiescence by the Applicant with other positions of the Examiner that have not been explicitly contested. Accordingly, Applicant's arguments for patentability of a claim should not be construed as implying

that there are not other good reasons for patentability of that claim or other claims.

No fee is believed to be due. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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